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PROGRAMMED M3T 300 TERMINALS DISCUSSED

Prague VYBER INFORMACI in Czech No 2, 1983 pp 203-207

[Text] The M3T 300 programmed terminal is produced by the Metra Concern Enterprise of Blansko. It was developed in cooperation with VUMS [Mathematical Machines Research Institute] of Prague. Since the second half of 1982, it has been available through the Kancelarske Stroje (Office Machines) Special-Purpose Concern Organization. This is a modern desktop computation aid for the following applications:

- Scientific and engineering computations of medium length;
- Acquisition, processing and communication of data of average volume;
- Control and automation of technological processes and measurements;
- Training of programmers;
- Applications in various industries.

The M3T 300.X Basic Terminal

The main parts of the basic terminal are a microprocessor, a main memory, a monitor, a keyboard, and a magnetic card random access memory. The ferrite-core main memory has a standard capacity of 8K words 16 bits long. It can be expanded with 4K-word semiconductor modules, to a total capacity of 24K or 28K words. The ferrite-core main memory contains a read-only section for storing the input/output routines. The alphanumeric monitor has a screen capacity of 256 characters in ASCII code, which means 8 lines of 32 characters each. The contactless keyboard consists of alphanumeric, numeric and function keys. Changeable printed overlays indicate the programmable functions of the function keys. The magnetic card random access memory permits reading, and writing on, PMC-05 magnetic cards (150 x 58 mm) with a capacity of 2 x 512 words. A part of the basic terminal is also a 16-bit indicator panel that displays, with the help of light-emitting diodes, the contents of the registers and memory locations.

External peripherals can be connected to the terminal by means of changeable adapters. The M3T 300.X basic terminal has room for a total of three adapters. An expander increases the total number of adapters to a maximum of 15. It is possible to communicate with the peripherals over two types of channels:

- A slow (program-controlled) channel, or
- A fast channel with direct memory access (DMA).

The basic terminal permits operation with program interrupts.

The basic terminal is produced in the following versions:

—The M3T 300.1 has a main memory with a total capacity of 24K words, and a communications controller that permits synchronous transmission at baud rates of up to 19,200 bps, using the BSC protocol and telecommunications lines, with a signal converter and an interface corresponding to CCITT V.24/V.28;

—The M3T 300.2 has a main memory with a total capacity of 28K words, but lacks a communications controller (if required, a communications controller must be connected by means of a separate adapter).

The basic terminal with the three built-in changeable adapters is a compact unit for desktop use, together with the connected external peripherals. The M3T 310 expanded version, which incorporates the M3T 300.X basic terminal, has provisions for installing and connecting additional adapters in the terminal's desk, up to a total of 15 adapters, and also for building in or connecting two or four floppy disk drives.

The M3T 303.X Changeable Adapters

- M3T 303.1 - For connecting an FS 751 A/M or FS 1503 tape reader, and a Robotron 1215 or DT 105 S tape punch;
- M3T 303.2 - For connecting a Consul 2111 or DZM 180 dot matrix printer;
- M3T 303.4 - For connecting an M3T 312 floppy disk memory;
- M3T 304.5 - Adapter with an IMS 2 (IEEE 488) bus for connecting measuring instruments;
- M3T 303.9 - Adapter for synchronous or asynchronous data transmission at rates of up to 2400 baud, CCITT V.24 or IRPS interface;
- M3T 303.11 - Clock, timer.

In addition to these adapters, whose production is starting up, the Metra Concern Enterprise is producing also other adapters; for example, to connect the DASIO unit for communication with the environment, etc.

Software

The basic systems program resides permanently in the read-only section of the main memory. Communication between the peripherals and applications software is by means of SIO (System Input-Output) utility routines.

Applications software is divided into basic applications software that is supplied with every terminal, and auxiliary applications software whose supply depends on the system's configuration and the range of applications.

Basic applications software consists of compilers for the following programming languages:

--Assembler, which is compatible with the language used by ADT or HP computers, and

--BASIC, which is suitable for scientific and engineering computations, and for other applications.

The system's auxiliary applications software includes the following:

--ATS BASIC (Automatic Test System) for the interactive writing of applications programs, and for the control of measuring instruments and of units for communication with the environment;

--A utility for BSC data communication;

--The KOKUO universal conversion program for local and remote data communication;

--The BSC (Basic Control System) punched-tape operating system that is similar to the BSC operating system for ADT minicomputers. It can run relative programs and contains compilers for Assembler, FORTRAN II and ALGOL 60 languages;

--The FDOS disk operating system with compilers for the Assembler and ATS BASIC languages, and with the KOKUO universal conversion program for local and remote data communication.

The basic software is supplied on magnetic cards or punched tape; the auxiliary software, on punched tape, magnetic cards or floppy disks, depending on the type of system.

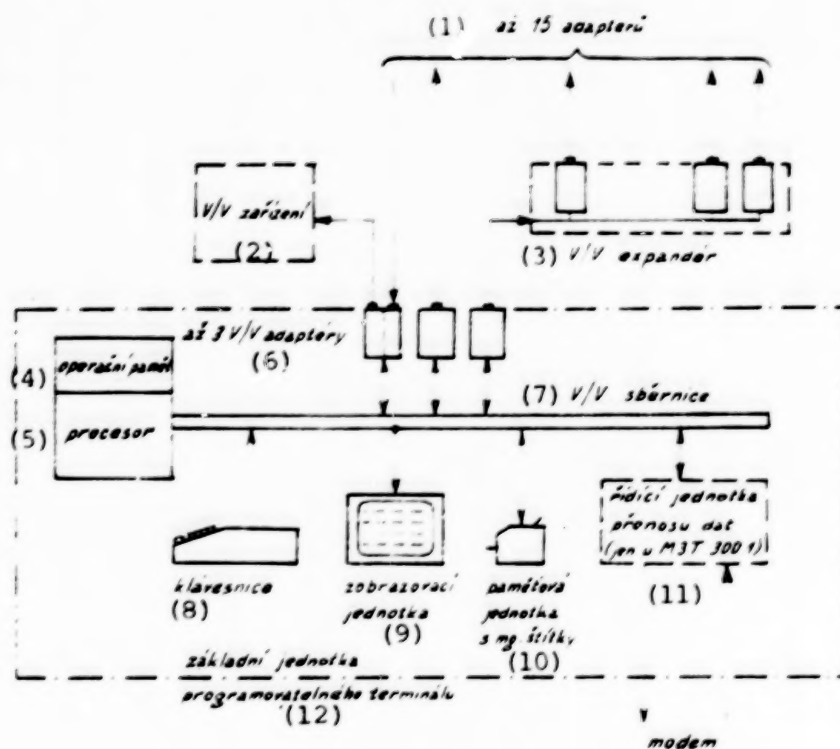
Data Communications Capabilities

The BSC (Binary Synchronous Communication) protocol permits data communication between M3T 300 terminals, or between an M3T 300 terminal and a higher-level JSEP [Unified System of Electronic Computers], IBM, ADT or Hewlett-Packard computer. For data communication these higher-level computers must be suitably equipped in terms of both hardware (a communication multiplexer or communication processor for a JSEP or IBM; for example, a communications module for the SC 1025; and a TC 104 or TC 110 communication adapter for the ADT 4500) and software (telecommunications access methods, such as BTAM, for a JSEP or IBM; utility routines for the communication adapters in the case of ADT minicomputers; applications programs that include the requirements for transmitting files, etc.).

Data communication between two M3T 300 terminals permits simple and efficient exchange of data files and a dialogue between the operators, independently of the higher-level computer processing system.

Communication is at the selected baud rate, in blocks up to 256 characters long, with block parity checking or a 16-bit cyclic code polynomial according to CCITT or IBM as a safeguard against transmission error. The employed decision-making feedback ensures automatic repetition of an error-free block. The telecommunications link may be either of the telephone type with modems at the two ends (for example, Czechoslovak modems MDS 1200) or of the galvanic type with a GDN signal converter. The employed signal converter must be equipped with a time base generator.

Thus the communications capabilities of the M3T 300 terminals permit communication within computerized control systems covering wide areas, and the incorporation of these terminals into hierarchical systems with higher-level computers.



Block diagram of the programmed M3T 300 terminal.

Key:

- | | |
|-------------------------|---|
| 1. Up to 15 adapters | 7. I/O bus |
| 2. I/O peripherals | 8. Keyboard |
| 3. I/O expander | 9. Monitor |
| 4. Main memory | 10. Magnetic card random access memory |
| 5. Microprocessor | 11. Communications controller (only in the M3T 300.1) |
| 6. Up to 3 I/O adapters | 12. Basic programmed terminal |

The programmed M3T 300 terminal is equipment that up to now has been lacking in the Czechoslovak market. It fills the gap between simple data entry and nonprogrammed terminals on the one hand, and ADT and SMEP universal minicomputers and JSEP computers on the other. Thanks to its modest requirements in terms of its footprint, power supply, operating environment and servicing, and to its communications and computing capabilities, it will find application in a number of organizations at specific work stations, thereby bringing computer technology closer to where it is needed the most.

The Brno plant of Kancelarske Stroje has been entrusted with marketing the M3T 300 terminals and providing the customer engineering services on the territory of the Czech Socialist Republic.

1014

CSO: 2402/61

AVT 110 AUTOMATIC MULTIPLE PROBE TESTER DESCRIBED

[Place of publication unknown] INFORMATION in German published by VEB ZENTRUM FÜR FORSCHUNG UND TECHNOLOGIE MIKROELEKTRONIK, [VEB CENTER FOR MICROELECTRONICS RESEARCH AND DEVELOPMENT] [no date given] pp 1-6

/Text/ The entry of microelectronics into the area of consumer goods manufacture cannot be stopped.

The constantly growing proportion of analog semiconductor components requires a stepped-up development and deployment of corresponding technological equipment.

Supported by our many years of experience in the area of semiconductor technology, we meet these requirements by continuous new and further developments.

Thus, the automatic multiple probe tester AVT 110 for static and dynamic tests on analog and digital switching circuits and for high-frequency measurements logically fits into our product palette.

Besides its universality, the AVT 110 is characterized by the following features:

- optional deployment of probe cards and manipulable probes
- self-production and repair of probe cards by soldering and adjusting equipment
- z-displacement of the probe needle on the probe cards
- circuit box for pin electronics

The technical and economic parameters of the automatic multiple probe tester AVT 110 satisfy the most stringent quality requirements and will guarantee you effective working results.

Use these advantages, keep in step with the time.

Structure

The automatic multiple probe tester AVT 110 is a desk-top unit and is designed for use in a sit-down job. The disposition of operating elements according to the most recent ergonomic information guarantees comfortable and safe handling of the unit. The device case, the electrical control unit with the programming area, the support column for the probe frame, and the stereomicroscope form the basic equipment of the AVT 110.

The device casing comprises the line connection, a 100-mm cross table with a stepping motor drive, as well as mechanical and electrical operating elements.

The support column can be equipped with a circuit box if needed. The circuit box is intended for pin electronics, i.e. supplementary circuitry of the semiconductor components above the probe. The probe frame which is used to receive the probe cards can be replaced by a probe bracket with a probe ring as a support for manipulable individual probes.

Mode of Operation

The probe frame or the probe bracket can be lifted out and can be moved vertically and horizontally through a hand-activated mechanism. The semiconductor wafer is inserted in this position, and is aligned by turning the wafer receptacle. The semiconductor component is precisely positioned below the probes by controlling the cross table (two speeds are available) by means of the manual manipulator.

Operating Modes

Automatic Operation

The cross table transports the semiconductor wafer in serpentine fashion underneath the probe tips. After reaching each step position, the wafer receptacle is automatically raised, so that a contact occurs between the semiconductor component and the probe needles. Electrical tests and a marking corresponding to the evaluation are then implemented.

Manual Operation

The cross table executes only one step in a preprogrammed grid in the x- or y-direction. The semiconductor wafer is lifted or lowered manually, and the marking of the measuring automat is also initiated manually.

Service Operation

To check and to adjust the device function, a continuous scanning cycle without a connected tester is possible.

Marking

The semiconductor components can be marked in their respective test position, after a test has been performed or in one of the following test positions, or simultaneous with the test that is being performed. The marking can take place optionally up to a maximum of four positions later. Two marking channels facilitate two-color marking.

Accessories

The soldering and adjustment equipment makes possible the independent construction as well as follow-up production of modifications of probe cards.

The probe card has 60 positions for needle and wafer search supports as well as ink markers. The mechanical and electrical connections between the probe card and the probes are soldered.

The needle support establishes the connection between the probe island and the measuring unit. The needle is replaceable.

The probe searching unit scans the semiconductor wafer for wafer edges. When contact is broken at the edge of the wafer, there follows a y-step of the cross table.

The ink marker identifies defective or selective components. The marking pen is operated electromagnetically. Marking takes place without contact using commercial ink. Up to four markers can be used.

The circuit box is provided for pin electronics, i.e. supplementary circuitry of the semiconductor component above the probe. The connection between the probe card and the circuit box is effected through brush contacts.

The manipulable individual probes are intended for the device type with a probe bracket and can be adjusted for the component configuration. The pen in the marking probe is driven electromagnetically. Marking is accomplished without contact.

Technical Data

Height x width x depth	550 mm x 980 mm x 570 mm
Weight	approximately 160 kg
Connection conditions	
Line voltage	220/380 V Hz three-phase current
power consumption	0.25 kW
Logic connection	TTL level - active state with 0 or L-0 where L = + 5 V
Pressure vacuum connection	13.3 kPa (100 torr)
Wafer fixation	Pneumatic, with underpressure
Microscope	Magnification
Stereomicroscope TECHNIVAL	Max. 100-fold
Climatic conditions	
Temperature range	$23 \pm 3^{\circ}\text{C}$
Relative humidity	60 ... 70 percent
Cross table	
Drive	Stepping motors
Wafer diameter which can be processed	102 mm \varnothing (4 inches)
Step unit	5 μm
Positioning error	$\pm 10 \mu\text{m}$ (at 20°C)
Running speed	max. 70 mm/s
Programmable step width	
Region I	0.01 (0.01) ... 9.99 mm
Region II	0.02 (0.02) ... 19.98 mm

Design with probe cards	
Needle carrier positions	max. 60 units
Wafer-finding support	max. 4 units
Probe cards	replaceable
Probe needle	replaceable
Fine adjustment range of the probe needle in the z-direction	0.2 mm
Stroke of the probe tip	0.1 mm
Contact force	$0.16 \pm 0.02 \text{ N}$ (16 p \pm 2 p)
Tip diameter	30 ... 38 μm
Marking support	max. 4 units
	multicolor possible
Manipulable probes	max. 80 units
Fine adjustment	
radial	$\pm 1 \text{ mm}$
tangential	$\pm 1.5 \text{ mm}$
vertical	$\pm 0.5 \text{ mm}$
Stroke of the probe tip	max. 0.2 mm
Contact force	$0.08 \dots 0.2 \text{ N}$ (8 ... 20 p)
Tip radius	12 ... 18/18 ... 25 μm

Supplementary Equipment

- Can be used for every equipment variant
 - Coordinate output for the reproducible localization of a semiconductor component relative to a definite coordinate origin on the semiconductor wafer.
 - Measurement line for making a connection between the probes and the measuring system. For Kelvin contacting, two measurement lines are required.
- Can be used for manipulable probes
 - Test equipment for contact force
 - Needle changer
 - Probe ring depot for storing three loaded probe rings

8348

CS0: 8120/1868

REPORT ON DEVELOPMENT, INSTALLATION OF INDUSTRIAL ROBOTS

West Berlin FS ANALYSEN in German No 1, 1981 (signed to press Mar 81) pp 1-23

[Booklet by Klaus Krakat: "On the Development, Production and Use of Industrial Robots in the GDR", published by the Forschungsstelle fuer gesamtdeutsche wirtschaftliche und soziale Fragen (research office for pan-German economic and social questions), 23 pp]

[Text]

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Summary

In the GDR, robot technology is only at the beginning of its development. Just like microelectronics, it was declared by the Party and government leadership of the GDR, only a relatively short time ago, to be a "main factor of scientific-technical progress". When applied meaningfully in industrial combines and enterprises, it is supposed to lead to the "perceptible advance in efficiency" that is required by Honecker. With its help, the still existing lack of efficiency in the national economy is to be eliminated. The basis for "socialist rationalization" is to be formed by a "long-term conception towards the accelerated development and application of microelectronics...; measures to develop, produce, and utilize industrial robots and numerical and non-numerical controls and machines", and their "conception towards development and further application of electronic computer technology...". The objective of rationalization efforts is already specified: By the end of the present five-year plan, in the year 1985, it is desired to use "at least 9000 robots" in industry and eliminate 6000 and 7000 jobs in favor of other activities. Up to now, however, a total of only 320 robots have been used by the end of 1980 e.g. in metallurgical plants, in automobile construction, in the electrical engineering industry, and in other industrial areas, according to the reports of the State Central Management for Statistics in the GDR. According to our own knowledge, the processes that are initiated by the use of microelectronics and industrial robots do not occur "smoothly and frictionlessly". Perhaps is "completely natural", so it is thought, that in the course of events basically new problems and questions as well as contradictions would arise and obstacles of various types would have to be overcome¹.

1. Different Attitude Towards the Utilization of Industrial Robots in the Federal Republic of Germany and in the German Democratic Republic

At the present time, about 5000 industrial robots - i.e. devices with more than four axes of motion - are being used in Japan, the USA, and Europe. Of these 5000 robots, 1250 were installed just in the Federal Republic of Germany towards the end of last year². According to forecasts, their number will increase greatly in the near future, especially by taking into account the opportunities of microelectronics. At the present time, "industrial robots are being introduced cautiously" in the Federal Republic, as was stated in a report of the Munich Computer Week in January of this year. The reasons for these reservations currently are too high investment costs, too high peripheral costs, and problems resulting from production conversion.³ However, in the GDR, one is not looking so askance at the use of industrial robots. The need to increase work productivity and the necessary implementation of profound rationalization solutions here make the fastest possible application of effective techniques necessary.

2. Lacking Efficiency in the GDR Economy as the Target of Party Criticism

In the GDR, the Party and government leaders are currently striving for the most comprehensive and rapid possible utilization of robots in industry. Here, robot technology is also considered "a main factor to accelerate scientific-technical progress". Besides microelectronics and electronic computer technology, this technology belongs to the most frequently mentioned rationalization aids, and is numbered among the supporting pillars of the new rationalization concept of the party and government leadership to implement the planning goals in the 80's.

In the area of electrical engineering and electronics in the GDR, objectives could not be fulfilled towards the end of the 70's, despite some developmental successes. The situation was characterized by bottle-necks, misdevelopments, and unnecessary set-backs.⁴ These facts were dealt with by Honecker in his report at the 11th Congress of the Central Committee of the SED at the end of 1979.⁵ Among other things, he emphasized clearly and critically,

- that, in view of the many tasks to be accomplished, "insufficient attention was being paid to the treatment of questions of scientific-technical progress".
- "We still lack scientific leadership in important areas, while at the same time, valuable information is not being converted into production."
- "When very small amounts of materials, spare parts, or other things for scientific-technical work are furnished by industry either too slowly or not at all, this impedes scientific-technical progress. These problems must be solved."⁶

Such clear references to existing and partly certainly avoidable defects as well as critical warnings to the address of the combine and enterprise managements provide information concerning the everyday nuisances and to situations in the "real socialism" of the GDR.

3. Rationalization Solutions to Overcome Bottle-Necks and Defects

In order to be able to overcome the weaknesses which are becoming apparent again and again, the Politburo of the SED in 1979 already worked out the foundations of a comprehensive "strategy" for the further economic development of the GDR. The centerpoint of the associated objectives is occupied by an efficiency increase in all areas of the national economy. According to Honecker's words in the 11th Congress of the Central Committee of the SED, the point is, "quickly to implement a 'rationalization advance' which is perceptible in the national economy"⁷. To secure its implementation, "the long-term conception of accelerated development and application of microelectronics in the national economy of the GDR; measures to develop, produce, and deploy industrial robots, as well as numerical and non-numerical controls of machines; the conception of developing and further applying electronic computer technology, as well as proposals for rationalizing management work" were decided upon.⁸

As a supplement of Honecker's explanations, Mittag, in his discussion speech in the 11th Congress of the Central Committee of the SED, also indicated "how, in the matter of rationalization, a great push is to be achieved."⁹ The first effects of the rationalization campaigns initiated by the Party appeared in 1980. The Robotron Combine, for example, reported about its rationalization plans and their implementation,¹⁰ and the Carl Zeiss Jena Combine set exemplary goals to other combines and enterprises with its initiatives. Consequently, in 1980 it was always cited as an example for its mode of operation. But robot technology also advanced by state support increasingly to an important instrument of rationalization. There is a noticeable increase generally not only concerning the opportunities of robot technology but no less concerning their development and deployment in the GDR. Industrial robots suddenly became a concept which, in the words of the Minister for Tool and Processing Machine Construction, Georgi, "is anchored

as a task in the decisions of our Party... and occupies an ever more important place in the thoughts and actions of many workers in our economy."¹¹

4. Industrial Robots for Taking Over Certain Working Processes

The current endeavors in the GDR are largely concentrated on the development and utilization of robots which, equipped as much as possible with sensors and micro-processors, primarily help to improve mass production. Furthermore, they should take over difficult and monotonous assembly work which previously was still performed manually. They should liberate working forces, which are urgently needed elsewhere for more demanding jobs. In 1979, and also at the beginning of 1980, "still 40 percent of all production workers were active in manual activity in the GDR and even almost 70 percent in the assembly areas."¹² Within the metal-processing industry, about 40 percent of the "basic production workers are active in assembly and there they perform 70 percent heavy physical work."¹³ Their proportion in the total production time expended in any case is between 35 and 40 percent. Studies in the GDR have shown, "that up to 85 percent of the assembly time just has to do with moving the work pieces." A similar situation is supposed to exist with auxiliary production processes.¹⁴

These facts and others mentioned in the GDR literature give occasion enough to rationalize production processes by the increased use of robot technology and to adjust the planning goals accordingly.

5. Characteristic Figures and Criteria for the Useful Economic Effect of Industrial Robots

The following characteristic figures and criteria for the useful economic effect of industrial robots are emphasized as important:¹⁵

- increasing work productivity
- saving work time
- saving working forces
- positive effects on the scientific work organization¹⁶ (improving working conditions, completing the organization on the job, completing working methods and procedures),
- completing the intra-business work division and cooperation,
- increasing the production capacity and the production volume (e.g. by increasing the automation level, overcoming production bottlenecks, process safety of new technology, etc.),
- positive effects of new production techniques on the product
- wage savings from the release of working forces
- reduction of working down-times, caused by difficult working conditions
- saving of costs for the training of employees
- one-time expenditures (especially investments)
- back-flow time of the one-time expenditures
- depreciations
- expenditures for programming and monitoring the robots
- profit increase through the reuse of released employees in the same business
- release expenditure per employee
- coefficient of utilization of robots in shifts
- production funds disbursements¹⁷

It is to be assumed that at least some of the above-mentioned characteristic figures in the plans of the national enterprises, thus e.g. in the plan of technical and organizational measures (TOM plan) in the "plan of economic utilization from measures of scientific-technical progress" or in the plan "basic fund reproduction"¹⁸ will be taken into account.

6. Long-Term Planning Objective: 9000 Industrial Robots, At Least, by 1985

The far-reaching consideration of microelectronics, as a presupposition for efficient robot technology, should in all cases bring fundamental changes. Thus, a study concerning GDR vehicle construction says, for example, that there, by using 880 robots, a total of 1300 employees can be saved.¹⁹ In metallurgy, it is intended to use about 500 industrial robots by 1985.²⁰ All in all, by 1985, the end of the current new five-year plan period, 6000 to 7000 jobs are to be replaced in industry by the well-aimed deployment of "at least 9000 robots", according to the ideas of the Party and government leadership in the GDR. The employees can be used for other activities.²¹ Especially in machine construction, 2.5 employees will be replaced on the average for each industrial robot.²² The industrial area "electrical engineering/electronics" received the commission within the framework of government decisions and planning concerning the development of particular robot types, to make available "standardized controls and applications of microelectronics, electrical drives and measuring systems, as well as cables and lines for the mass production of industrial robots and handling technology" within the present five year plan.²³

The fulfillment of the following preconditions is necessary for the most effective possible application of robot technology:²⁴

- "Timely and comprehensive political-ideological, technical-organizational, and cadre-like preparation, which must be designed with a long view ahead";
- information for the employees "concerning the technical-economic advantages of robot utilization" and its "positive social effect under Socialist production conditions";
- timely qualification of the use collective
- timely decision concerning the "necessary changes in business and production organizations" through the application of robot technology;
- consideration of influences of robot utilization on "preceding and subsequent processes";
- inclusion of one's own construction of rationalization means in the implementation of the optimal solutions that are specifically adapted to business conditions.

7. The Current Use of Industrial Robots - Competition on the Occasion of the Tenth Party Congress of the SED

At the present time, the GDR is still at the beginning of development in the area of robot technology. At the beginning of 1980, about 160 robots were utilized in the GDR industry.²⁵ By the end of 1980, "220 robots were used", as Mittag announced in his discussion at the 13th meeting of the Central Committee in December of 1980.²⁶ In the "Report of the Government Central Management for Statistics concerning the Implementation of the Economic Plan for 1980", on the other hand, it says verbatim: "In the year 1980, the number of industrial robots in the national

economy has increased to 320, including 244 robots in the metal processing industry."²⁷ When specifying these two considerably different numbers for 1980, different definitions of the term "robot" were certainly used as a starting point²⁸, or else there exists an obvious error in one of the two reports. An overfulfillment of the plan-design will scarcely be involved in the case of the figures quoted by the governmental Central Management for Statistics in the GDR.

To be able to implement their very ambitious plans, all the activities in the relevant combines and enterprises, e.g. the industrial area "electrical engineering/electronics" as well as the area of tool and processing machine construction and scientific installations, were coordinated and strongly promoted with a view to the development and utilization of robots. This was already done early on on the basis of the "government development conception", and was carried out by the Party and government leadership and other government organs. For example, in the Dresden area, several combines, enterprises, and scientific institutions joined together in the middle of 1980 to form a "cooperative association for industrial robots". The objective of this association is to exchange experience and to coordinate work so as to "develop, produce, and utilize industrial robots" as fast as possible. Among the participants of this cooperative association belong the VEB (State Enterprise) Combine Robotron, the TU Dresden, the Center for Research and Technology of Microelectronics, as well as the Chamber of Technology.²⁹ About the same time, the regional association in Suhl of the Chamber of Technology organized an information and technical meeting on "industrial robots", whose objective was to transmit "information, experience, and presuppositions in the preparation for deploying industrial robots".³⁰ Because of its manifold experience in the handling of electronically controlled and hydraulically driven robots, the VEB Sachsenring Automobile Works Zwickau was declared to be the "consultation point for the use of industrial robots for all enterprises of the Ministry for General Machine-, Agricultural Machine-, and Vehicle-Construction".³¹ At the initiative of the regional management of the SED, the "territorial working communities" were formed, thus, for example, the "development-, production-, and application-community for industrial robots" in East Berlin or the "scientific-, production - community for industrial robots" in the area of Karl Marx Stadt.³²

For example, already at the Leipzig Spring Exhibition in 1980, industrial robot controls were presented from the VEB Combine Automated System Construction. Robot technology finally could also be seen at the 23rd "Central Exhibition of the Masters of Tomorrow" (ZMMM), which took place in Leipzig in 1980. Here, preparation for deploying industrial robots was demonstrated.³³

Following the developmental lines outlined by the Party and state leadership, there suddenly arose in various industrial combines and enterprises the activities which have a view to the implementation of a "rationalization push" by means of robot technology, comparable to the activities in connection with the beginnings of microelectronics in the GDR in the years 1977/1978.³⁴ At the present time, especially at the occasion of and in honor of the impending 10th Party Congress of the SED, which will take place in East Berlin from 11 to 16 April 1981, there are reports about manifold "initiatives". A focal point regarding the "competition for a 10th Party Congress" is formed by the preparation of modern technologies and methods and their most rapid possible transfer into production. Thus, for example, a collective of automation enterprises in the Mansfeld Combine 'Wilhelm Pieck' wants to produce a total of "46 control units for industrial robots and

microcomputers in excess of their 1980 production, of these 24 already by the 10th Party Congress of the SED."³⁵ The tool machine combine "Fritz Heckert" Karl Marx Stadt and other combines of the tool and processing machine industry also report activities on the occasion of the impending party congress. This area wants to achieve "a significant increase" in the construction of rationalization means "with the production of about 500 units of handling technology and 90 robots".³⁶

The combine Robotron Dresden is also making a contribution towards rationalization. Here, special robots are being developed and built for mechanical assembly. After the first 10 robots, which are still being tested, another 10 robots will be produced by the Party Congress.³⁷ Within the "framework of competition in the honor of the 10th Party Congress", the "youth collective of the Institute for Mechanics" at the Academy of Sciences of the GDR "wants to make a contribution towards optimizing the mechanical construction elements for present and future industrial robot generations".³⁸

It is characteristic for the development and production, e.g. of industrial robots, that is "rationalization means", in the GDR, without any doubt, that here, among others, the enterprises must become active, especially on the basis of the Combine Ordinance of November 1979.³⁹ This they must do in their character as special rationalization enterprises within the combine associations and the resulting task definitions. This is true, although this could scarcely be expected on the basis of the actual production tasks of the combine. An example of this is the rationalization and automation enterprise Wittstock in the Mansfeld combine "Wilhelm Pieck".

The use areas of the present robots installed in the GDR enterprises vary. Thus, for example, they are operating:⁴⁰

- in metallurgical plants (among others, Maxhutte Unterwellenborn),
- in plastics processing (plastics processing enterprise Schwerin),
- in the electronics industry (e.g. in the VEB Electrical Project and Systems Construction, Berlin-Lichtenberg, the parent company of the combine VEB Automation Systems Construction),
- in the electronics industry (e.g. to solve special "rationalization problems", developed, produced, and deployed by Robotron)
- in automobile construction (e.g. in the VEB Sachsenring Automobile Works, Zwickau, Trabant Manufacturer)
- in the Hettstett Rolling Mill for "consumer goods production"
- in machine construction and
- in tool and processing machine construction (e.g. in the VEB Combine Forming Technology "Herbert Warnke" Erfurt, or in the tool machine combines "Fritz Heckert" Karl Marx Stadt, and "7 October" in East Berlin).

8. Products of Robot Technology and Their Manufacturers

In adaptation to international development, development and production of robot technology in the GDR runs in three main directions.⁴¹ Accordingly, one must distinguish:

1. Loading robots: These are built by the modular principle and the assemblage of individual subassemblies is guided by the specific application. They are used for the handling of work pieces (feed-in and withdrawal of work pieces, e.g. for tool machines, furnaces, presses, etc.);
2. Technological robots: This involves universal robots which are generally used to guide tools, e.g. during welding, spray painting, or sandblasting;
3. Assembly robots: These are capable, by scanning and perceiving, of gripping work pieces and tools, and to join work pieces with precision.

In the GDR, the following combines, enterprises, and scientific institutions are mainly active in the area of robot technology (research, development, and production):

- the VEB Numerik "Karl Marx", Karl Marx Stadt (production enterprise in the VEB Combine Automation Systems Structure in East Berlin). Here, the following are fabricated among others: ⁴²
 - the control IRS 2000 for industrial robots
 - the freely programmable control IRS 600, based on the Robotron microcomputer K1520,
 - the freely programmable control CNC 600, likewise equipped with a Robotron microcomputer K1520 (8 bit microcomputer with 64 Kbytes) as well as the new development of a CNC manual feed station, presented at the Leipzig Spring Fair 1981.
- VEB Robotron Rationalization Weimar (Production Enterprise in the VEB Combine Robotron Dresden):⁴³
 - industrial robots PHM 3 (PHM = programmable handling means), an hydraulically driven insertion automat, which works on the basis of the microcomputer K1520;
 - the freely programmable industrial robot PHM 4, which is coupled with an optical sensing unit (developed by Robotron, Center for Research and Technology, in collaboration with Ilmenau Technical College).
- Research Center for Tool Machine Construction, Karl Marx Stadt in collaboration with the tool machine combine "Fritz Heckert" Karl Marx Stadt and the tool machine combine "7 October" in East Berlin:⁴⁴
 - industrial robot IR 2, to be used for the "feeding, withdrawal, and transmission of rotation-symmetric work pieces during machining in small and medium series production".⁴⁵ This robot is currently being "constructively revised". New functional modules for the IR 2 are being tested in the combine Orsta-Hydraulik.⁴⁶
 - industrial robot IR 2/II, further development of the robot IR 2.
 - industrial robot IR 3 P, a robot developed with the VEB Sachsenring Zwickau, as so-called "youth object", for which the work to expand its application possibilities has now been concluded in the spring.⁴⁷
 - industrial robot IR 5/10, this robot was exhibited at the Leipzig Spring Fair by the combine VEB Locomotive Construction-Electrical Engineering Plants "Hans Beimler" Henningsdorf, in connection with the flame butt welding machine SU 63 with microelectronic control for tool loading.⁴⁸

- industrial robot IR 6-10, whose use preparation was presented in Leipzig at the last ZMMM.
- VEB Central Engineering Enterprise of Metallurgy (ZIM) in collaboration with the Rationalization Enterprise Wittstock and "Engineers and Technicians of the Metallurgical Combines" (production beginning at the end of 1979):⁴⁹
- industrial robot ZIM 60, an articulated robot which was designed especially for areas of metallurgy. Control systems are used for this robot which work on the basis of Robotron microcomputers.
- Central Institute for Welding Technology:
 - arc welding robot R 14 ZIS 11-25 for the MIG/MAG welding of components with a weight up to 30 kg. "The motional apparatus for the welding torch has three translational units in the coordinates x, y, z", as a press release for the Leipzig Spring Fair 1981 indicates among other things.⁵⁰
- Mansfeld Combine:⁵¹
 - production of control boxes for industrial robots and
 - special control units for industrial robots.
- VEB Rationalization Radio and Television Dresden:⁵²

Development and production of a special robot to assemble antenna plug connections for the VEB Antenna Works Bad Blankenburg (production enterprise in the VEB Combine Radio and Television Stassfurt).
- VEB Tool Machine Factory Zeulenroda (production enterprise in the VEB Combine of Shaping Technology "Herbert Warnke" Erfurt):⁵³

Industrial robot MIRE 4/2 for platinum processing, presented at the Leipzig Spring Fair 1981. The robot developed by the Research Center for Shaping Processes of the combine in Zwickau has a pneumatic drive and is equipped with a freely programmable control.
- VEB High-Current Systems Construction Erfurt (production enterprise in the VEB Combine Electrical Energy Systems Construction Leipzig):
 - Production of particular controls for tool and processing machine construction.
 - Development, testing, and deployment of special robots for vehicle construction in the VEB Sachsenring Automobile Plant Zwickau, and
 - research and development work at the Academy of Sciences (AdW) of the GDR in close connection with the institutions, universities and other scientific institutions that are active at the combine and enterprise level in the area of robot technology.

9. Close Cooperation within the CEMA

The relatively laborious development and testing of industrial robots is being done in the GDR in collaboration with other CEMA countries. Collaboration in this area has been agreed upon in the long term and in great detail within the framework of the "standing CEMA Commission for Machine Construction". Thus, for example, Bulgarian manipulators are already being used in machine systems from

GDR production, and the welding robots that are active in GDR vehicle construction are partly being equipped with Soviet microprocessors.⁵⁴

In the meantime, various types of industrial robots are being used in individual CEMA countries, which are largely domestic developments and domestic production.⁵⁵

10. Industrial Robots and the Real Existing Socialism

The GDR literature emphasizes as seriously different the use of robots in "different social systems". In the mode of presentation typical for the GDR, it says on this point: "The capitalist primarily wants to increase his profit, where the employees make no difference to him at all."⁵⁶

Robots are here used not in the interest of the workers, since they primarily perceive the application of this new technology in the form of increasing unemployment.⁵⁷ As a proof of the correctness of this statement, one likes to point, among other things, also to West German sources.⁵⁸ Here, the statements given there are generally interpreted in a manner appropriate for one's own reports concerning "class contradictions and capitalism". Naturally, by contrast, favorable pre-suppositions for robot utilization exist in the GDR because of the "socialist social system". Previous developments - so it says - indicate that "only socialism is capable of applying scientific-technical progress meaningfully and for the welfare of the people."⁵⁹ Thus, in the GDR, robots are used "to facilitate heavy work and to do away with monotonous activity, to produce more cheaply and effectively, but primarily to obtain people for new, more highly qualified tasks, for example in the electronics industry."⁶⁰ - That's how easy it is to describe the application of robot technology in two different social systems! -

The development of scientific-technical progress does not proceed as problem-free and smoothly with the forced increase of microelectronics and the multiplied utilization of robots, as appears according to the representations concerning robot utilization in "socialism". This is proven by the most recent statements of Reinhold, Director of the Academy for Social Sciences at the Central Committee of the SED, in the GDR monthly "Einheit":⁶¹ "It would be a mistake to assume that the processes associated with the accelerated development of science and technology, especially with microelectronics, proceed smoothly and frictionlessly. It is completely natural that, in their course, fundamental new problems, questions, and contradictions will arise, and that obstacles of various types must be overcome. Modern science and technology not only change the production and working structure, applied technologies, but also working and living conditions of many workers. Many people have to change their jobs, their profession, or the collective, their business and sometimes also their residence. They must give up their habits, and adapt to something new."⁶² Within the framework of his further explanations, Reinhold also touched on discussions in the GDR, in which the question is raised again and again whether the job security guaranteed by the SED is not a contradiction to technical development. As Reinhold admits, "the practical answer to this question is not simple. The fact that it must be answered shows the great initiative in the preparation of the 10th Party Congress."⁶³

FOOTNOTES

1. O. Reinhold: "Economy and Ideology in the further Shaping of Developed Socialist Society", *Einheit (Unity)* No. 2/1981, p. 112.
2. Compare H. Gross: "The Iron Specialist - A Survey of the Status Quo", *technotip* No. 12/1980.
3. K. Groth: "Industrial Robots Introduced with Hesitation", *Computerwoche (Computer Week)* No. 4 of 1-23-1981, p. 1 and 2.
4. In this connection, compare, among others, K. Krakat: Implementation of Scientific-Technical Progress Using Microelectronics as an Example. *FS Analysen (FS Analyses)*, No. 1/1980, p. 106ff.
5. E. Honecker: "From the Report of the Politburo to the 11th Meeting of the Central Committee of the SED", *Neues Deutschland (New Germany)* of 12-14-1979, p. 4.
6. The same, *ibid.*
7. E. Honecker, *ibid.*, p. 6.
8. *Ibid.*
9. G. Mittag: "With a Political Spirit of Struggle for High Efficiency", *Neues Deutschland (New Germany)* 15/16-12-1979, p. 7.
10. In this connection, compare, among others: W. Sieber: "Rationalization of Management Work in the Combine", *Einheit (Unity)* No. 3/1980, p. 285-291, as well as W. Sieber: "Robotron Rationalized, Experience, Result, Projects", *Die Wirtschaft (The Economy)* No. 7/1980, p. 9-12.
11. R. Georgi: "Industrial Robots increase the Technical and Technological Level", *Einheit (Unity)* No. 1/1981, p. 25.
12. B. Udke: "Industrial Robots - Whom Do They Help?" *Arbeit und Arbeitsrecht (Work and Working Law)* No. 4/1980, p. 4. - In this connection, compare also H. Dietze: "Trends and Requirements in Robot Technology, More than a Human Hand", *Die Wirtschaft (The Economy)* No. 5/1979, p. 20, as well as H. Kammerer: "Industrial Robots - What They Can Do and Why We Need Them", *Neues Deutschland (New Germany)* of 1-24-1980, p. 3.
13. M. Pavloff: "Industrial Robots as the Action Direction of Scientific Technical Progress to Facilitate Human Work", *Sozialistische Arbeitswissenschaft (Socialist Labor Science)* No. 1/1981, p. 35.
14. H. Dietze, *loc. cit.*, p. 20.

15. Intensification of social production by scientific-technical progress; record of a scientific conference with international participation on the occasion of the Congress of Economic Sciences at Karl Marx University, Leipzig, 21 and 22 November 1979. Conatined in: Scientific Contributions of Karl Marx University, Leipzig, Series on Social Sciences, Leipzig, 1980.
16. In the GDR, the "scientific work organization (WAO)" is defined as follows: It is "the shaping of collaboration of workers with their working means and their working objects, their relationships among one another in their working classes, as well as environmental conditions corresponding to the most recent scientific information. It has the objectives of creating such conditions for the activities of workers which make possible for them a high level of performance as well as all-round physical and spiritual development..." In this connection, also compare J. Strassburger in: GDR Manual, 2., completely revised and expanded edition. Published by the Federal Ministry for Internal German Relationships, Cologne 1979, pp. 58-61.
17. Production fund disbursement involves interest-like disbursements of national enterprises to the entire gross capital assets and the working capital. This disbursement is supposed to achieve the most efficient possible use of operating equipment. - In this connection, also compare W. Fdrster: Calculation and Business Arrangement. A Contribution Toward Diagnosing the Central Management Business of the Soviet Type and its Reforms from a Business Perspective. Eastern Europe Institute at Berlin Free University, Publications of Economic Science, Vol. 27, Berlin 1967, pp. 165ff, as well as the keyword "Production Fund Disbursement", GDR Manual, loc. cit. p. 862 and 863.
18. As regards the basic fund calculation, compare, among others, W. Fdrster: Calculation and Business Arrangement, loc. cit., p. 99 and 108.
19. Compare ADN Bulletin, No. 23 of June 1979, p. 2.
20. Compare "Soon a Robot will be Handling the Press; Completely New Technologies by Microelectronics", Tribune (Tribune) No. 47 of 3-6-1980, p. 1.
21. See, among others, G. Mittag in his discussion at the 13th Meeting of the Central Committee of the SED, Neues Deutschland (New Germany) of 12-12-1980, p. 4.
22. In this connection and for further facts concerning robot technology, compare the explanations of the Minister for Tool and Processing Machine Construction in the GDR, R. Georgi: "In Machine Construction, Stable Combines Secure A High Performance Rise", Neues Deutschland (New Germany) of 3-6-1981, p. 3.
23. W. Albert: "Use of Robots Promotes Efficiency", Press Information No. 58 of 5-16-1980, p. 4.
24. R. Georgi: "Industrial Robots Increase the Technical and Technological Level", loc. cit. p. 29 and 30.

25. Compare B. Udke, loc. cit. p. 145.
26. G. Mittag: "From the Report of the Politburo to the 13th Meeting of the Central Committee of the SED", Neues Deutschland (New Germany) of 12-12-80, p. 5.
27. "Report of the State Central Management for Statistics Concerning the Implementation of the National Economic Plan 1980" Neues Deutschland (New Germany) of 17/18 January 1981, p. 4.
28. Under the term "industrial robots" are understood in the GDR "handling devices which have at least two axes, of which at least one is freely programmable and which can automatically process and repeat an inputted program." H. Zachau: "Industrial Robots and Process Automation", messen-steuern-regeln (Measurement-Control-Regulation) No. 1/1980, p. 52. - In contrast to this, the specifications in Japan, the USA, and in Europe for installed robots and devices start from the idea that they have more than four axes of motion. Compare H. Grössl: "The Iron Specialist - An Inventory", techno-tip No. 12/1980.
29. "Cooperation Association for Industrial Robots Formed", Neues Deutschland (New Germany) of 7-22-1980, p. 2.
30. In this connection, compare "Technical Congress on Industrial Robots", messen-steuern-regeln (Measurement-Control-Regulation) No. 1/1981, p. 49.
31. H. Kämmerer, loc. cit. p. 3.
32. Compare R. Georgi: "Industrial Robots Increase Technical and Technological Level", loc. cit., p. 30.
33. Compare "Electrical Engineering/Electronics Exhibits at the 23rd ZMMM in Leipzig", messen-steuern-regeln (Measurement-Control-Regulation), No. 1/1981, p. 56.
34. In this connection compare K. Krakat: "Implementation of Scientific-Technical Progress using Microelectronics as an Example", loc. cit., p. 18ff.
35. "Mansfeld Internal Initiative for Robots and Rationalization", Neues Deutschland (New Germany) of 21/22-2-1981, p. 1.
36. "Quick Introduction to Modern Technologies - Focal Point in the Competition for the Party Congress", Neues Deutschland (New Germany) of 3-4-1981, p. 3.
37. R. Watzl: "Important Contribution towards the Policy of the Main Task" Neues Deutschland (New Germany) of 3-5-1981, p. 3. - Compare also "Robotron Robots", rechentechnik/datenverarbeitung (Computer Technology/Data Processing) No. 9/1980, p. 3.
38. In this connection, compare "Praesidium of the Academy of Sciences to Erich Honecker: The World Status is the Guideline for our own Production", Neues Deutschland (New Germany) of 28/29-3-1981, p. 3.

39. In this connection, compare the "Ordinance concerning national combines, combine operations, and national enterprises", of 8/11/1979, Law Journal of the GDR, Part 1, No. 38 of 11/13/1979 page 355 (1, para 1 (1)). Further references in this connection: Business and Management Organization has specified a new Formation of Combines, Documents concerning Socialist Business Management, published by the Central Institute for Social Business Management at the Central Committee of the SED, Berlin (East) 1979, p. 327, 328; K. Krakat: Organizational Practice in the GDR, Examples for Business and Management Organization, FS Analyses No. 3/1980, p. 20, as well as K.H. Wilhelm: "Internal Construction of Rationalization Means at any Price?" Die Wirtschaft (The Economy) No. 6/1980, p. 16.
40. In this connection, compare, among others, the following GDR publications: H. Kämmerer: "Industrial robots - what they can do and why we need them", loc. cit., page 3; "A robot will soon handle the press", loc. cit. p. 1; B. Udke: "Industrial robots - whom do they help?", loc. cit. p. 145; K. Oppermann: "Industrial robots take over the heaviest work", Press information No. 70 of 13 June 1980, p. 2; H. Brodkorb and J.G. Kretzschmar: "Utilization of the microcomputer Robotron K 1520 in the industrial robot PHM 3", Neue Technik in Büro (New Technology in the Office) No. 6/1980, p. 171-175; R. Watzl: "Important contributions toward the policy of the main task", loc. cit., p. 3.
41. Compare, R. Georgi: "Industrial robots increase the technical and technological level" loc. cit. page 26 and 27, as well as H. Zachau: "Industrial robots and process automation", loc. cit. p. 52-56.
42. In this connection, compare W. Albert: "Utilization of robots promotes efficiency", loc. cit., p. 5, as well as supplementary exhibition and customer information of the VEB Numeric "Karl Marx Stadt and G. Mollenberg: "CNC 600. A numerical control system on a microcomputer basis", radio-fernsehen-elektronik (Radio-Television-Electronics) No. 11/1979, p. 694-700.
43. Compare, among others, H. Brodkorb and J.G. Kretzschmar: "Utilization of the microcomputer Robotron 1520 in the industrial robot PHM 3", loc.cit. p. 171-174, as well as "Technical Congress on Industrial Robots", loc. cit. p. 49.
44. Compare "Electrotechnik/Elektronik-Exponate" (Electrical Engineering/ Electronics Exhibitions), loc. cit. p. 56; further: Technical Congress on Industrial Robots, loc. cit. p. 49, as well as "Fast introduction to modern technologies - a focal point in the competition for the Party Congress", loc. cit. p. 3.
45. "Technical Congress on Industrial Robots", loc. cit. p. 49.
46. Compare "Fast introduction to modern technologies - a focal point in the competition for the Party Congress", loc. cit. p. 3.

47. Compare H. Teichmann: "Banner of Honor of the Central Committee for Engineering Schools. Training, Teaching, Research with High Practical Effectiveness" Neues Deutschland (New Germany) of 3-19-1981, p. 3.
48. Press Information, Leipzig Spring Exhibition 1981, Branch Report on Welding Technology, p. 3.
49. In this connection, compare among others "A Robot Will Soon Handle the Press", loc. cit., p. 1 and K. Oppermann: "Industrial Robots Take Over the Heaviest Work", loc. cit., p. 2, as well as "FDJ at Life's Focal Points in the Front Row. Industrial Robots Come From the Youth Master Area Friedhelm Schläfke, Rationalization Enterprise Wittstock", Neues Deutschland (New Germany) of 2-25-1981, p. 5.
50. Press Information, Leipzig Spring Exhibition 1981, Branch Report on Welding Technology, loc. cit., p. 3.
51. Compare "Mansfeld Internal Initiative for Robots and Rationalization", loc. cit., p. 1 and 3.
52. Compare W. Albert: "Use of Robots Promotes Efficiency" loc. cit., p. 5.
53. Compare Press Information, Leipzig Spring Exhibition 1981, Branch Report on Welding Technology, p. 8.
54. Compare in this connection ADN Bulletin, loc. cit. p. 2.
55. Concerning robot technology in the CEMA, compare among others "Robot Technology in Socialist Countries", Die Wirtschaft (The Economy) No. 5/1979, p. 20; "New Industrial Robots from the CSSR", rechentechnik/datenverarbeitung (Computer Technology/Data Processing) No. 1/1979, p. 2; "Workers of Iron Help to Increase Performance", Pravda of 12-13-1979 (reprinted in: The Press of the Soviet Union (PdSU), No. 4/1980, p. 51 and 52); "Industrial Robots of 60 Types", Die Wirtschaft (The Economy) No. 10/1980, p. 29; "Robot Technology in Bulgaria" Die Wirtschaft (The Economy) No. 10/1980, p. 29; "Comprehensive Use of Industrial Robots", Pravda on 8-9-1980 (reprinted in: PdSU No. 18/1980, p. 18); A. Timofejew: "The Family of Industrial Robots", Technika i Nauka No. 7/1980 (reprinted in: PdSU No. 18/1980, p. 18-20); as well as M.N. Chmelnizki: "Equipment of Purging Press Machines with Controls and Electronic Devices" Kuznetschno-shtampowotschnoje Proiswodstwo No. 7/1980 (reprinted in: PdSU No. 24/1980, p. 25 and 26).
56. Radio GDR on 1-11-1981, 13.06 O'clock: "The Radio Talk Hour".
57. In this connection, compare among others H. Kämmerer: "Industrial Robots - What They Can Do and Why We Need Them" loc. cit., p. 3; B. Udke: "Industrial Robots - Who Do They Help?", loc. cit., p. 145; M. Pawlow: "Industrial Robots as the Action Direction of Scientific Technical Progress to Facilitate Human Work", loc. cit., p. 37-38; as well as H. Nick: "Modern Technology for or against Human Welfare" Einheit (Unity) No. 3/1981, p. 226-233.

58. Thus, for example, Frankfurter Rundschau (Frankfurt Survey) of 1-6-1979.
59. H. Kämmerer, loc. cit. p. 3.
60. Radio GDR on 1-11-81.
61. Compare O. Reinhold: "Economy and Ideology in the further Shaping of Developed Socialist Society", Einheit (Unity) No. 2/1981, p. 105 - 113 (especially p. 112 and 113).
62. O. Reinhold, loc. cit, p. 112.
63. O. Reinhold, loc. cit. p. 113.

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